
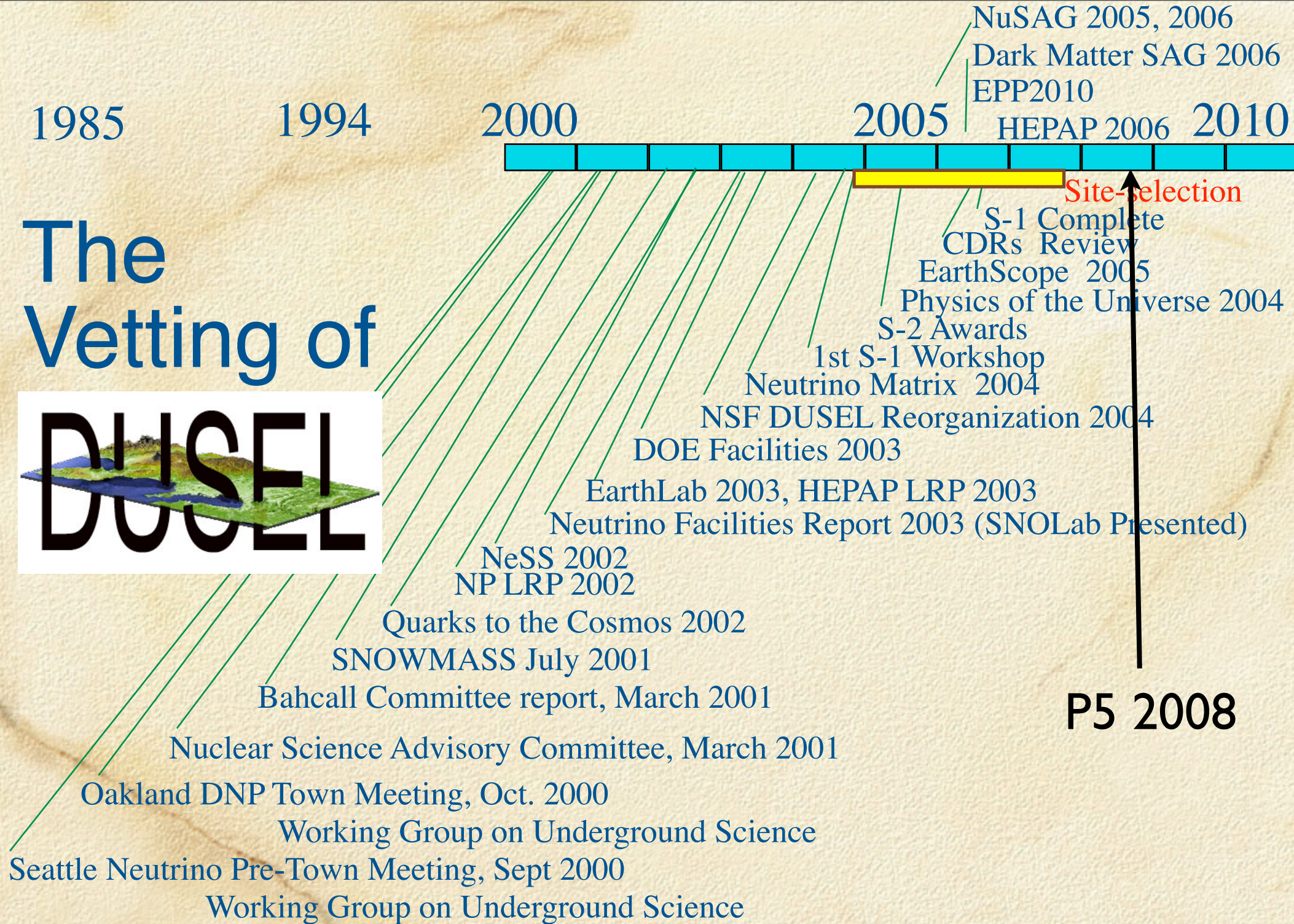


DUSEL Status

Milind Diwan
Brookhaven National Laboratory

June 13, 2008

The Vetting of DUSEL

DUSEL Progress

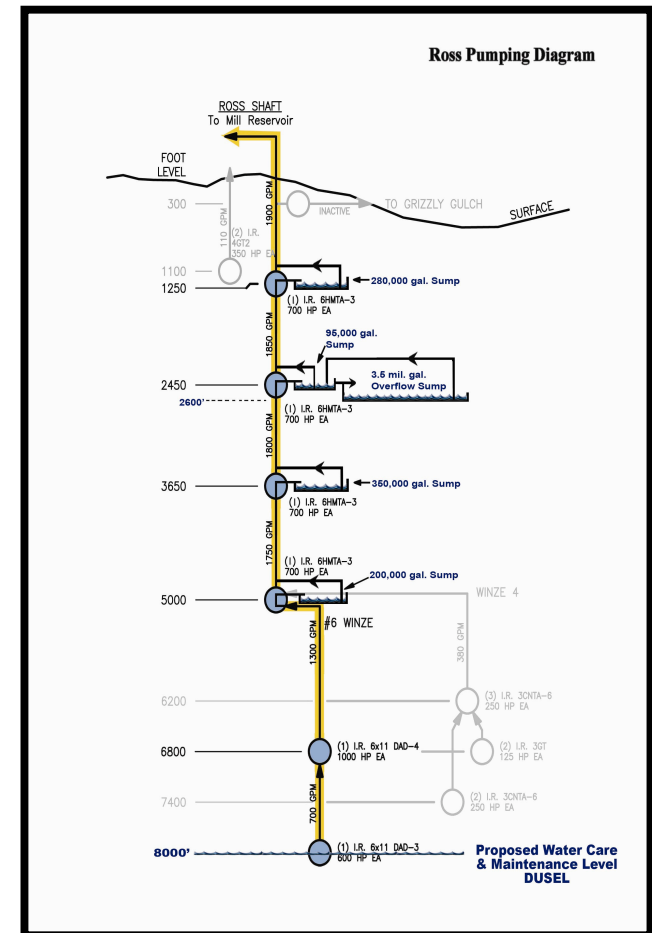
- DUSEL Three-Step Process
 - S-1 Assess the Science -- DeepScience
 - S-2 Project Science onto Sites -- CDRs
 - S-3 Select a site -- Homestake
 - \$15M, 3 year planning grant with UCB
- DUSEL as an MREFC (Major Research Equipment and Facilities Construction)
 - Recommendation to Advance to *Readiness*
 - ~\$500 - 600M
 - ~\$250M Facility
 - ~\$250M Initial Suite of Experiments
 - Physics Driven, but Multidisciplinary Facility

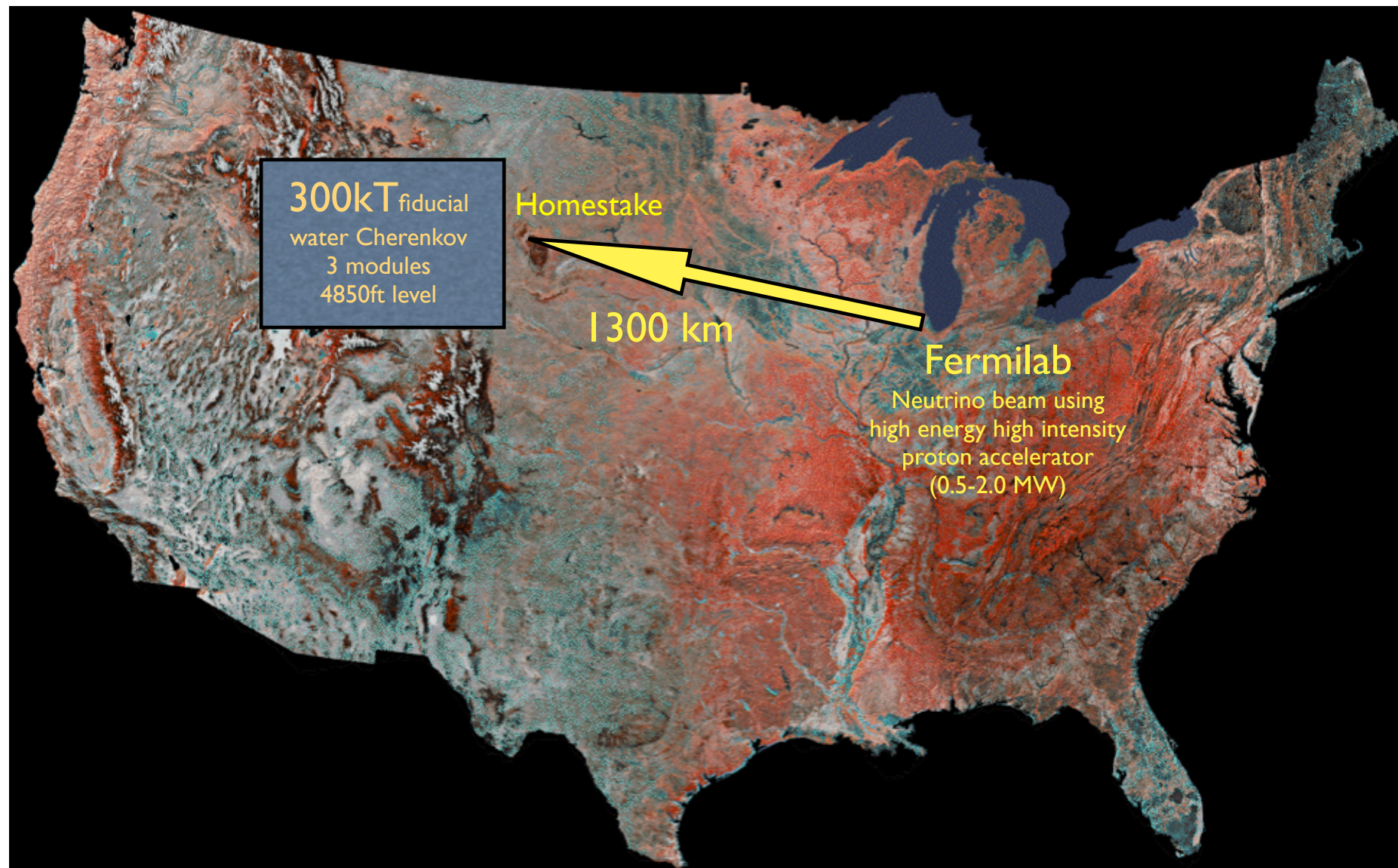
The Next Round of Solicitations

- **S-4 Develop Superset of Experiments**
 - Provide \$15M over 3 years to develop ISE plans
 - Any day now...
 - All disciplines
- **S-5 Select Initial Suite of Experiments**
 - S-4 is neither necessary nor sufficient for ISE
 - There are additional “on ramps” for experiments other than NSF “S-x” solicitations

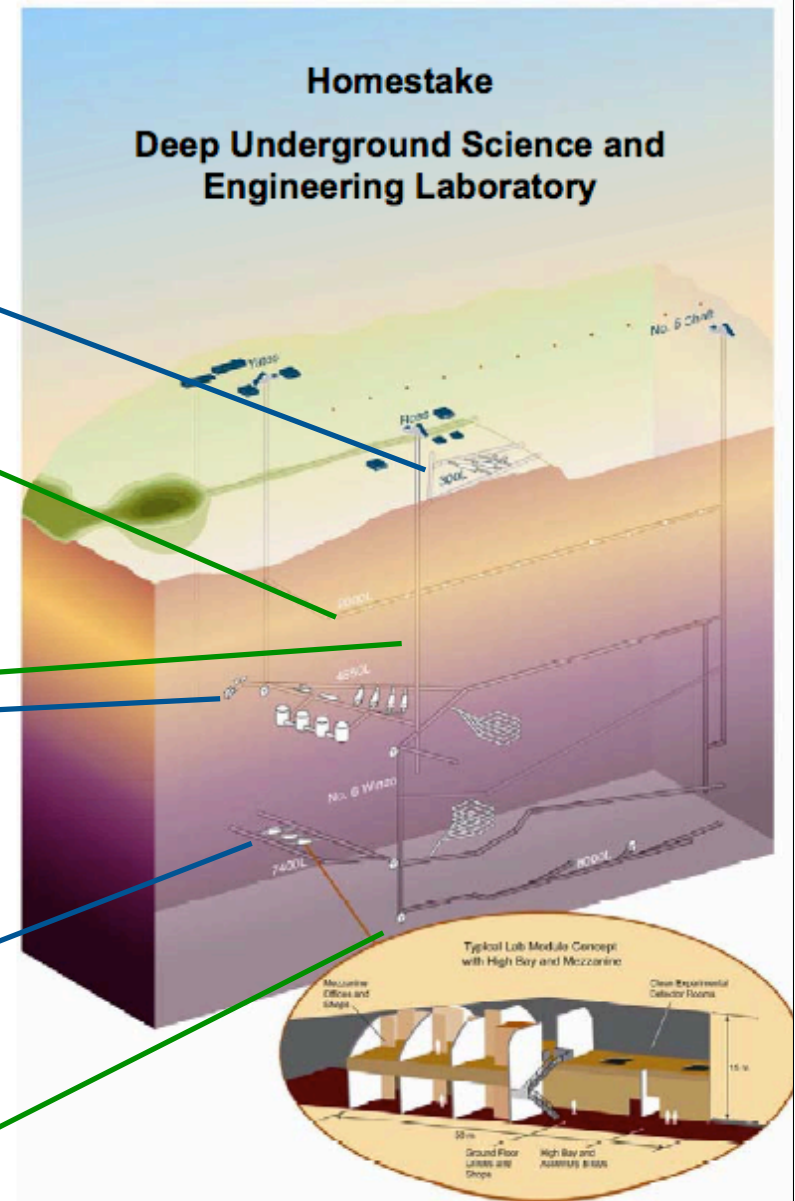
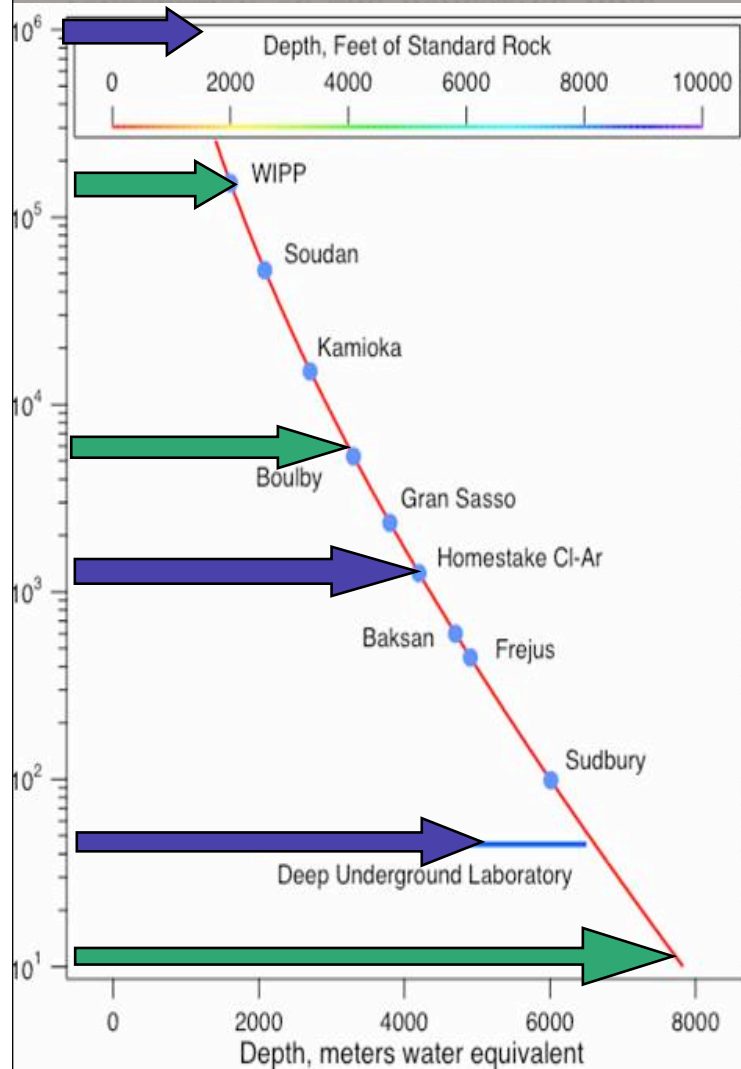
Progress at the Sanford Lab

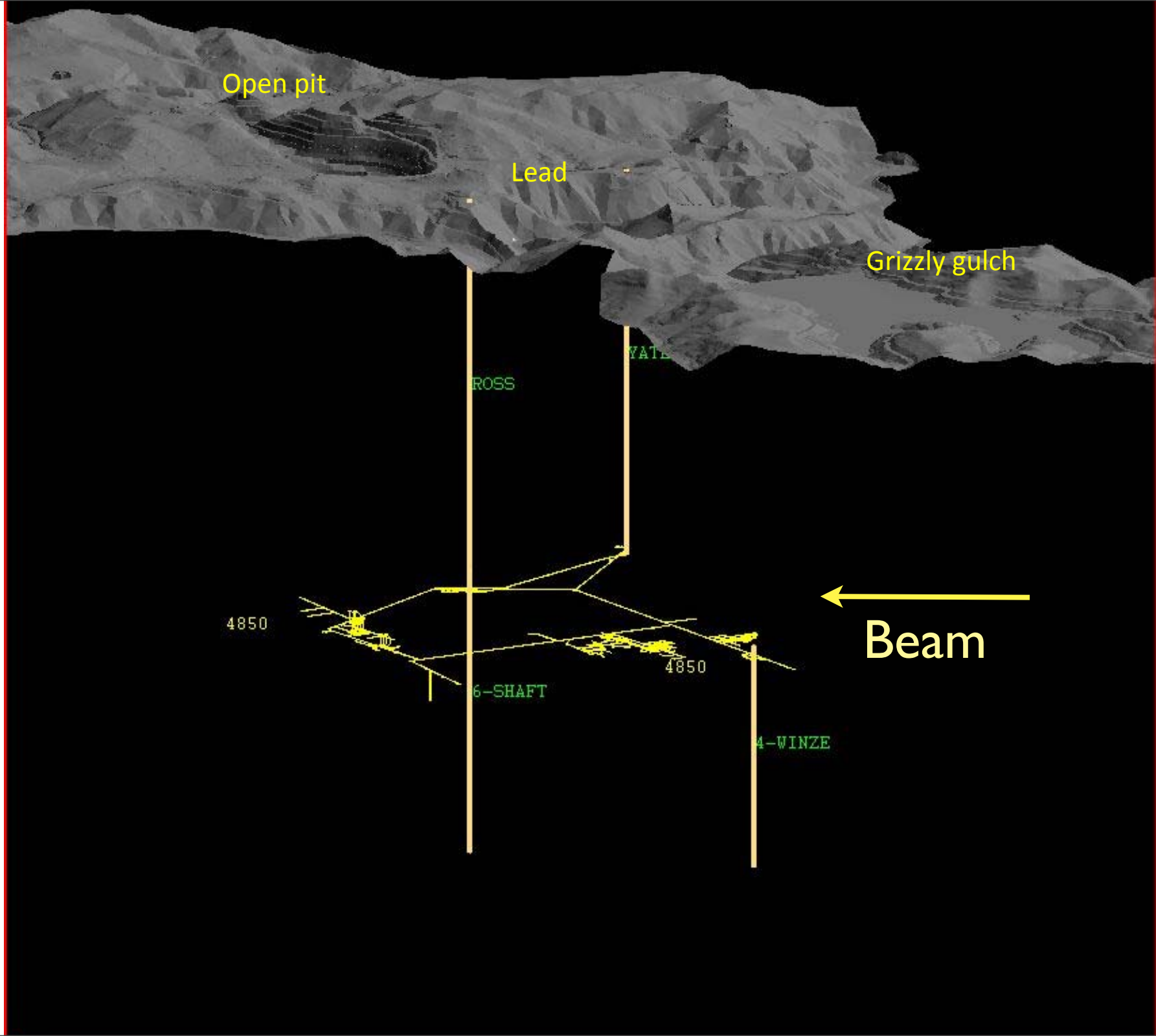
- \$115M state-funded effort
- Jose Alonso Lab Director
- Focusing on stabilizing facility and starting early science as Sanford Lab
- Pumped 3.5M G in April & May
- Routine pumping by June
- Access to 4850L by Sept
- Science at 4850L by Dec



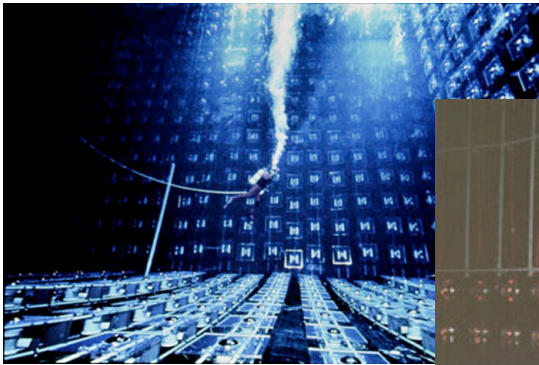


Research Campuses

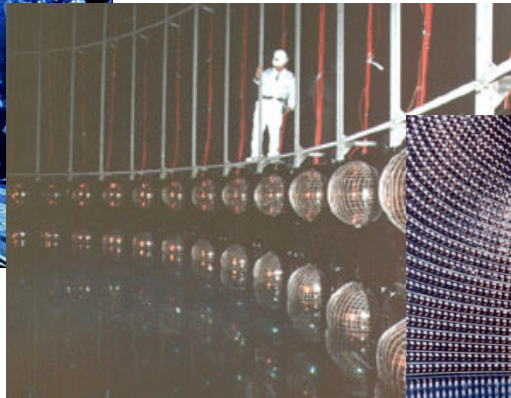




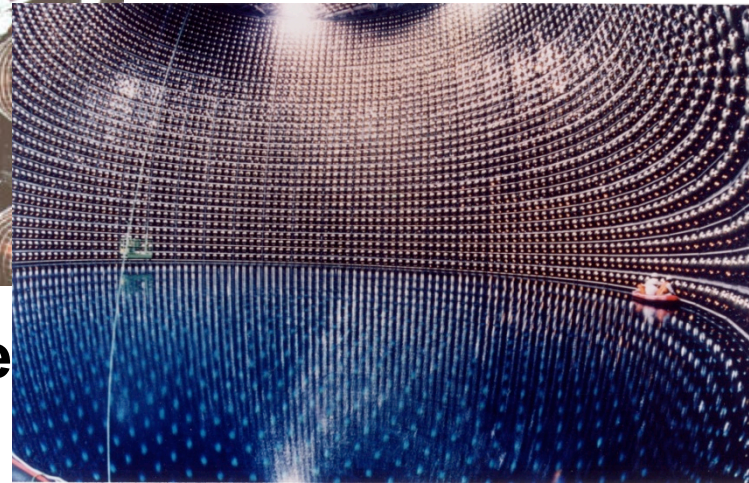
Water Cherenkov Detector



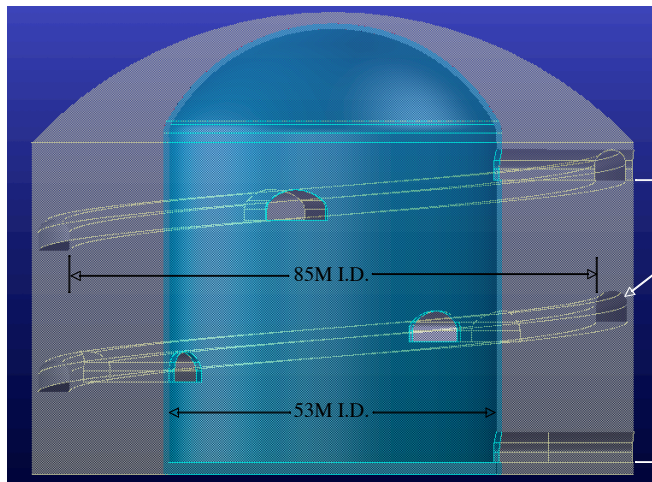
IMB
3 ktons



Kamiokande
1 kton



Super-Kamiokande
22 ktons

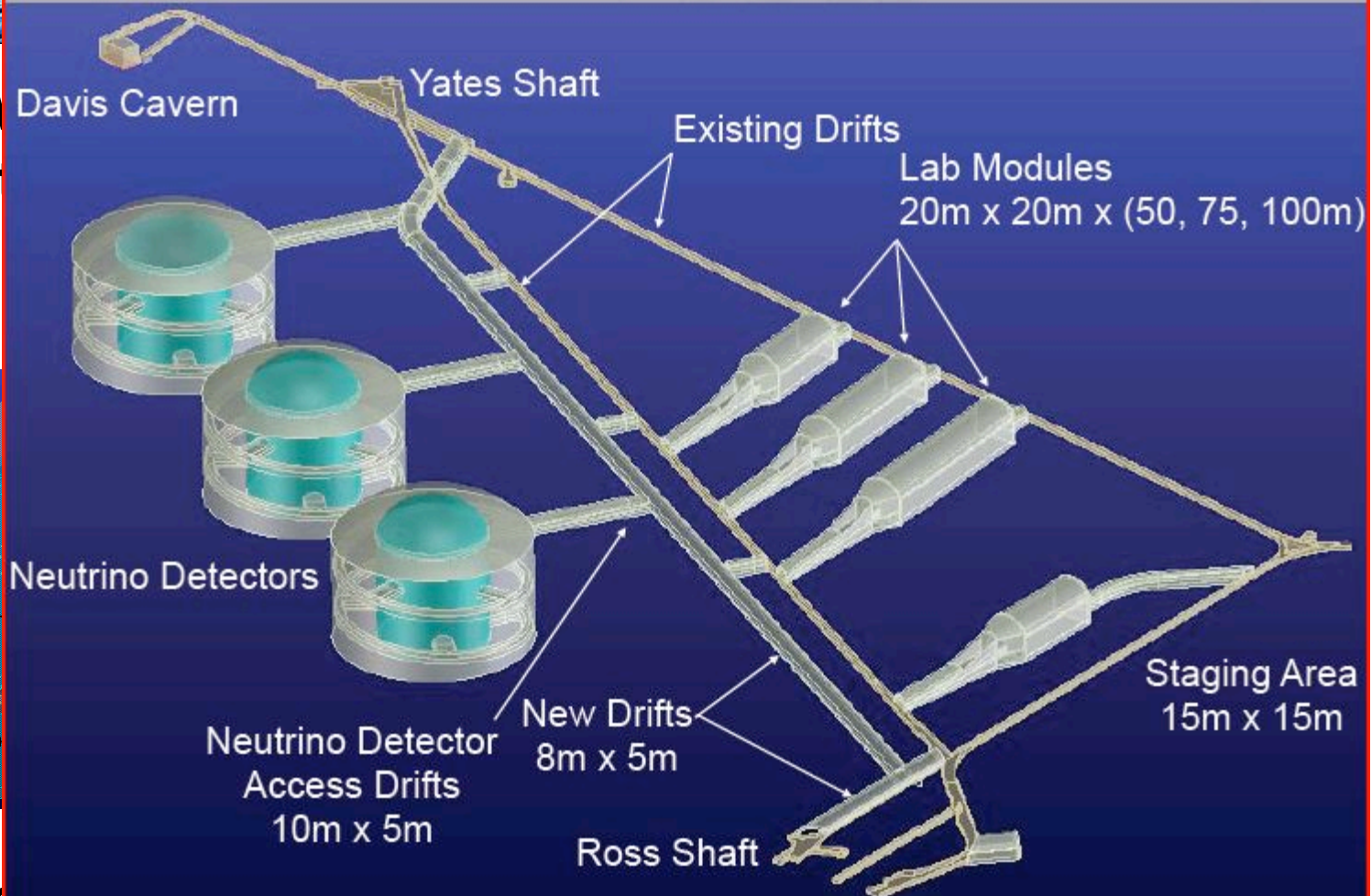


1 module fid: 100 kT

300 kT

Water Cherenkov Detector

4850 Level Conceptual Layout



300 kT

The long paper trail

W. J. Marciano, “Long baseline neutrino oscillations and leptonic CP violation,” Nucl. Phys. Proc. Suppl. **138**, 370 (2005).

M. V. Diwan, “The case for a super neutrino beam,” Heavy Quarks and Leptons Workshop 2004, San Juan, Puerto Rico, 1-5 Jun 2004. arXiv:hep-ex/0407047.

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The (2007) FNAL BNL joint study on
long baseline neutrinos
<http://nwg.phy.bnl.gov/fnal-bnl>

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long baseline neutrinos
<http://nwg.phy.bnl.gov/fnal-bnl>

Technical details on detector
performance, feasibility. NuSAG report
from 2007 based on this study

The P5 recommendations

Chair: C. Baltay, 21 members

P5+NuSAG+DUSEL site panel+FNAL PAC+BNL PAC > 100 examiners

http://www.er.doe.gov/hep/HEPAP/reports/P5_Report%2006022008.pdf

The Intensity Frontier

The accelerator-based neutrino program

- Measurements of the mass and other properties of neutrinos are fundamental to understanding physics beyond the Standard Model and have profound consequences for understanding the evolution of the universe. The US can build on the unique capabilities and infrastructure at Fermilab, together with the proposed DUSEL, the Deep Underground Science and Engineering Laboratory proposed for the Homestake Mine, to develop a world-leading program in neutrino science. Such a program will require a multi-megawatt proton source at Fermilab.
- The panel recommends a world-class neutrino program as a core component of the US program, with the long-term vision of a large detector in the proposed DUSEL laboratory and a high-intensity neutrino source at Fermilab.

P5 budget scenarios were DOE/HEP only

The DUSEL Facility

- The physics program of the Deep Underground Science and Engineering Laboratory is of central importance to particle physics. Experiments at DUSEL would address many issues, including neutrino physics, proton decay, dark matter, and neutrinoless double beta decay. DOE and NSF should define clearly the stewardship responsibilities for such an experimental program.
- The panel endorses the importance of a deep underground laboratory to particle physics and urges NSF to make this facility a reality as rapidly as possible.
- Furthermore the panel recommends that DOE and NSF work together to realize the experimental particle physics program at DUSEL.

Neutrino Program (cont)

- The panel recommends proceeding now with an R&D program to design a multi-megawatt proton source at Fermilab and a neutrino beamline to DUSEL and recommends carrying out R&D on the technology for a large detector at DUSEL.
- Construction of these facilities could start within the period considered by this report.
- A neutrino program with a multi-megawatt proton source would be a stepping stone toward a future neutrino source, such as a neutrino factory based on a muon storage ring, if the science eventually requires a more powerful neutrino source. This in turn could position the US program to develop a muon collider as a long-term means to return to the energy frontier in the US

Neutrino Program (cont)

- The panel further recommends that in any funding scenario considered by the panel, Fermilab proceed with the upgrade of the present proton source by about a factor of two, to 700 kilowatts, to allow a timely start for the neutrino program in the Homestake Mine with the 700-kilowatt source.

These accelerator-based neutrino measurements are extremely challenging and have ambiguities in the interpretation of results. The proposed U.S. and Japanese programs take complementary approaches that together would greatly enhance the understanding of the underlying science. One particular advantage of the envisioned US program is the long baseline available from Fermilab to the Homestake site.

- A very significant coming of age for the field of neutrino physics. We are ready for a grand program that is central to particle physics.
- There will be a Project planning meeting at FNAL: June 20.
 - <https://solid.physics.ucdavis.edu/mailman/listinfo/lbduse1>
- There will be a workshop at BNL: Oct. 16-17 titled “Underground Detectors Investigating Grand Unification.”

Emerson

America is the country of the future. It is a country of beginnings, of projects, of vast designs and expectations.